

Art as Research

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Cultural Importance of Scientific Research & Technology Development

The arts are perplexed about what to do in response to the growing importance of scientific and technological research in shaping culture. One response positions artists as consumers of the new tools, using them to create new images, sounds, and video; another response sees artists emphasizing the critical functions of art to comment on the developments from the distance; a final approach urges artists to enter into the heart of research as core participants. See my paper "Dark & Light Visions" (SIGGRAPH Visual Proceedings, Art Show Catalog, ACM, Chicago, 1993. Also available at <http://userwww.sfsu.edu/~swilson>) for a more detailed analysis.

It is a critical error to conceive of contemporary research as merely a technical enterprise; it has profound practical and philosophical implications for the culture. The shaping of research and development agendas could benefit from the involvement of a wider range of participants including artists.

Scientific and technological research is not as "objective" as many of its practitioners would like to believe. While some of its practices strive toward objectivity, the whole enterprise is subject to larger political, economic, and social forces. Historians of science and technology have documented the winds that determine what research ends up getting supported, promoted, and accepted and what products win in the marketplace. Thomas Kuhn's *The Structure of Scientific Revolutions* (University of Chicago Press, 1970) shows how paradigms dominate thought and scientific practice until new paradigms develop. Many possibly significant theories and technologies are ignored.

As research increases in general cultural importance, it becomes more dangerous to accept this triage as inevitable. Valuable lines of inquiry die from lack of support because they are not within favor of particular scientific disciplines. New technologies with fascinating potential are abandoned because they are judged not marketable. Our culture must develop methods to avoid the premature snuffing of valuable lines of inquiry and development. I believe the arts can fill a critical role as an independent zone of research. Everyday life is increasingly dominated by the objects and cultural forms created by technology research. For example, telephones, computers, entertainment systems, medical equipment, transportation systems, governmental and policing systems, and product distribution technologies shape the ways people in the developed world spend their days, interact with others, and conceptualize the present and the future. The output of technology research is not confined to small technical niches. Theorists such as Baudrillard and Virilio, for example, expose the hidden assumptions, shaping of categories and pervasive consequences of technology.

Scientific research similarly reaches beyond narrow academic questions. Astronomers attempt to understand the origins and shape of the universe. Breaking with all prior human history, they can look at the universe using radio wave, ultraviolet, and infrared "eyes" and see a universe quite different than what has been known. Biologists increasingly unravel mysteries of life and invent methods for manipulating the genetic heart of life. Scientific research will have profound practical and philosophical implications.

[Survey of areas of emerging research of interest to artists](#)

What is an Appropriate Role for the Arts?

Throughout the last centuries (after Leonardo) during which science and technology have been increasing in importance, the arts have failed to develop a viable role. Often they have tried to ignore these developments and treat them as peripheral to the core of culture. Even when artists did attend to these developments, they did so as distant commentators, sniping from the audience, often without deep understanding of the world views and processes of scientific research. I believe there is a much stronger role for the arts in which artists integrate critical commentary with high level knowledge and participation in the science and technology worlds.

For the last sixteen years I have been exploring this approach of artist as researcher. I have incorporated the monitoring of research developments into my artistic discipline. I monitor science and technology journals, participate in on-line forums, and attend technology trade shows and academic meetings. I engage the developers in discussion about their products. I have been appointed as beta tester and developer for several technology companies and acted as artist in residence in corporate research centers. I have functioned as an inventor and won a patent for a method I developed to integrate interactive electronics with print.

Emerging technologies are my medium. I seek them out before they become widely known. I focus on them to understand where they come from, where they might go, and what might be their cultural implications. I experiment with them to see if they have unexplored potentials.

These years as a shadow researcher have been illuminating. I have read in the literature of intriguing developments that never saw the light of day. I have seen many inventions and emerging technologies killed because marketing departments judged that no money could be made. I have seen entire R&D departments and their years of research blown away by the winds of corporate politics. Government and corporate support for basic research has almost disappeared and the concern with the bottom line has shortened the payback horizon to the point that few risks are taken. I have encountered debates in the scientific community that devalue approaches that do not fit the paradigms currently in favor.

I am worried that the invisible hand of the marketplace might not be so wise as many would like to believe. The judgments that make short term sense for stockholders do not make sense for the culture. The peer review referees of scientific journals cannot always see beyond their disciplinary blinders. Many good ideas are orphaned, unheeded in the wilderness. Scientific and technological research are so critical that we cannot afford the premature elimination of these ideas and efforts that do not find favor through traditional channels.

The arts can function as an independent zone of research. They could become the place where abandoned, discredited, and unorthodox inquiries could be pursued. They might very well value research according to criteria quite different from those of the commercial and scientific worlds. The roles of artists could incorporate other roles such as researcher, inventor, hacker, and entrepreneur. Even within research labs artist participation in research teams could add a perspective that could help drive the research process. (See my editorial, "Industrial Research Artist" Leonardo, vol 17:no.2 - 1984). Several traditions of the arts uniquely equip them for this function:

- Artistic traditions of iconoclasm mean that artists are likely to take up lines of inquiry devalued by others.

- The valuing of social commentary means that artists are likely to integrate widely ranging cultural issues in their research.
- Artists are more likely to incorporate criteria such as celebration and wonder than commercial enterprises.
- The art's interest in communication means that artists could bring the scientific and technological possibilities to a wider public better than peers in other fields.
- Artistic valuing of creativity and innovation meant that new perspectives might be applied to inquiries.

The recent history of the personal computer illustrates the need for this independent research function and the role the arts might serve. Early developers such as Apple Computer founders Steve Wozniak and Steve Jobs found little support for their ideas about the personal computer from the companies they worked for. Supervisors signed waivers on the ideas because they could not imagine any market for a desktop computer used by individuals. Similarly, the discipline of computer science was mostly uninterested in software and hardware issues related to these computers. Advances often came from individuals who worked outside traditional academic and business channels. Teenagers became world experts and artists made significant contributions in the development of interface design and image/ sound processing.

Similarly demonstrating the value of art-research cross fertilization , the SIGGRAPH (ACM international organization for computer graphics research) annual meetings have included an art show since their beginnings. These shows have been influential in several ways. Artists have been able to learn about emerging computer graphics research and technologies long before they became products to the extent that they could start experimenting with them. In parallel fashion, researchers have become acquainted with artistic work that pushed the technology in unanticipated directions and offered ideas for new research directions.

If the culture had to rely only on traditional lines of research, we might have had to wait much longer for the developments that have profoundly shaped the last decades. This story potentially could be repeated many times in many other fields of inquiry if alternative venues for research are developed. The arts could well serve this function if artists are prepared to learn the knowledge, language, work styles, self discipline, and information networks that are instrumental in their fields of interest.

Preparing Artist/ Researchers

What must artists do differently than they always have done to prepare to participate in the world of research. They must broaden their definitions of art materials and contexts. They must become curious about scientific and technological research and acquire the skills and knowledge that will allow them to significantly participate in these worlds. (See my article "Research and Development as Source of Ideas and Inspiration for Artists" - Leonardo vol 24:no. 3 1991- for examples of research that could be of interest for artists.) They must expand conventional notions of what constitutes an artistic education. The parameters of the science and technology education required is not yet clear. Can artists find the right mix of objective and subjective processes? Can artists learn enough to engage in research at a non-dilettante level? Scientists and technology researchers who have devoted their entire professional lives to educating themselves about topics being investigated might be sceptical.

At the same time artists must keep alive artistic traditions of iconoclasm, critical perspectives, play, and sensual communication with audiences. They must be willing to undertake art explorations that do not

neatly fit in historically validated media and offer their work in new contexts. Here are some concrete steps artists can take to prepare:

- Pay attention to discourse about technical and scientific topics in popular and professional media. Develop the ability to penetrate beneath the surface presentation to think about unexplored research directions and unanticipated implications.
- Acquire background knowledge and skills related to technological topics either through formal and informal means
- Learn about the information sources used by scientists and engineers to learn about emerging fields including academic and professional journals, trade shows, academic meetings, and equipment supply sources. Many of the trade magazines are free for validated research practitioners. (Artists can acquire this validation by self-identifying their art investigations as research.)
- Learn about relevant on-line information resources such as mailing lists, newsgroups, and Web sites that have become so crucial in scientific communication. (Luckily the growth of the Internet and World Wide Web have made it easier than ever for artists to enter into these information networks.)
- Develop new kinds of mutually beneficial collaborations with companies, universities, and other organizations involved in research.

What is a Viable Role for Artists in Research Settings?

The viability of this kind of collaboration is so critical to the future of both art and research that it is worth thinking about in more detail. What can researchers contribute to art and what can artists contribute to research? Why can high tech companies gain from artists being involved?

Much of the most well known collaborations between artists and scientists/engineers do not provide good models. For example, the EAT (Experiments in Art and Technology) in the 60's and the LA County Museum collaborations in Art & Technology produced some interesting art but did not profoundly address the role of artists in research. Often the engineers functioned as technical assistants to the artists or the artists dabbled with new technologies.

Better models would provide more mutual benefit. Early examples, include Bell Labs involvement of artists in sound research that was instrumental to telephony, electronic sound, and electronic voice research and electronic music. Also, artist Sonia Sheridan's artist in residency at the 3M research center in the 70's helped influence the development of color copier technology as well as shaping her development of the Generative Systems program at the Art Institute of Chicago that influenced so many artists. More contemporary examples include the artist-in-residency programs initiated by the Xerox PARC research center and Interval research company. These collaborations experimented with mutual definitions of research agendas. The Xerox PARC experience will be described more fully in a book to be published by MIT Press.

Skeptics sometimes wonder what possible contribution artists can make to serious research and development. Artists can augment the research process in several ways. They can define new kinds of research questions, provide unorthodox interpretations of results, point out missed opportunities for development, explore and articulate wide ranging implications of the research, represent potential user perspectives, and help communicate research findings in effective and provocative ways. They can bring centuries of artistic experience to bear on the technological future. They often approach problems in ways quite different than those of scientists and engineers. The critical role of designers and artists in computer human interface research over the last years demonstrates this new model of interdisciplinary research.

Computer Art is Not the Future - New Challenges

Many "high tech" artists believe they have already addressed the future by becoming computer artists who work with digital image, sound, and interactive multimedia. They have made a critical error. They have misunderstood the real significance of artists' work with computers during the last decade and a half. The new media are interesting, but more important is the fact that artists were experimenting with microcomputers at almost the same time that other kinds of developers and researchers were. Artists were not merely using the results of research conducted by others but were actually participating as researchers themselves.

Many new technologies such as genetic microbiology promise to have similar or even greater impact on life and thought. Artists need to actively patrol the frontiers of scientific and technological research to identify future trends that could benefit from the artist/research inquiry. Knowledge of computers and the Internet will be valuable assets because they will be required tools in most areas of research. Artists who think, however, they are in the vanguard because they work with computers may soon find themselves in the backguard. Below I list some areas of scientific inquiry and technological development that I believe may have cultural impact and will be fruitful areas for artistic inquiry. This diverse idiosyncratic list is by no means exhaustive and identification of other areas of interest should be considered an important artistic activity of our era:

New biology	Extra-sensory phenomena
Animal Consciousness	Brain physiology
Medical technology	Touch, Taste, and Smell research
Biosensors	Artificial life
Alternative Energy	Materials science
Cosmology	Non visual astronomy
Space science	Artificial Intelligence
Hypermedia	Robotics
Gesture recognition	Speech recognition & synthesis
Wearable computing	Information visualization
Groupware	Computer-Telephone Integration
Inspectable movies	Virtual Reality
Ubiquitous Computing	Surveillance & remote sensing
Bar codes and auto ID	GPS (geographic locating systems)
Intelligent home	Intelligent hi-way

The Integration of Research and Art

Research is shaping the future in profound ways beyond the utilitarian confines of the technology produced. Our culture desperately needs wide involvement in the definition of research agendas, the actual investigation processes, and in the exploration of the implications of what is discovered. Artists can contribute significantly to this discourse by developing a new kind of artist/researcher role.

The appropriate contours of this involvement are not yet defined. Much experimentation is required. How can research settings learn to be open enough to benefit from the unorthodox contributions artists might make? How can artists learn to involve themselves in the ways and byways of researchers without losing touch with their artistic roots. (Many of the best young artists I had as students who became involved as researchers ultimately ended up being seduced by the recognition and economic rewards of research that they quit functioning as artists.) Also scientific inquiry and technology development are not identical processes; what kind of involvement in each might artists fashion for themselves

I am not claiming that artists should act exactly like researchers. If they did, they would be unlikely to make any unique contribution. Contemporary art often includes elements of commentary, irony and critique missing from "serious" research. Similarly scientists and technologists strive toward objectivity; artists cultivate their idiosyncratic subjectivity as a major feature of what they do. The "research" that artists created will most likely look different than that produced by traditional researchers. It would work like art always does - provoking and moving audiences through its communicative power and unique perspectives. Still it might simultaneously work as research - using systematic investigative processes to develop new technological possibilities or to discover useful new knowledge or perspectives.

Maybe the segmented categorization of artist and researcher will itself prove to be a historical anachronism; maybe new kinds of integrated roles will develop. Signs of this happening already appear. Some of the hackers who pioneered microcomputer developments may one day be seen as artists because of their intensity and their culturally revolutionary views and work. Similarly some art shows such as Ars Electronica now define research ideas as core themes (for example, artificial life) and invite researchers along with artists as key presenters. Research has radically altered our culture and will continue to do so. Art must be an essential part of this process.

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